

Large Area Silicon Carbide Photodiode Active Pixel Sensor, Phase I

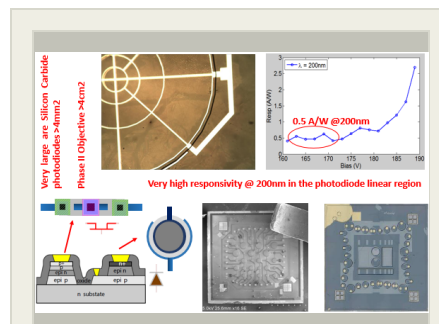
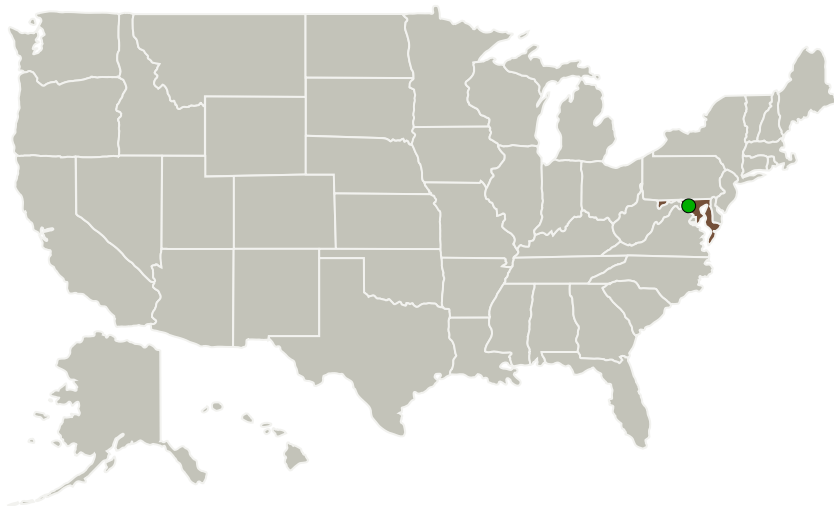
Completed Technology Project (2015 - 2015)



Project Introduction

CoolCAD Electronics, LLC, is proposing the design and fabrication of silicon-carbide based active pixel sensor, comprising a very LARGE AREA SiC UV photodiode ($>4\text{mm}^2$ in Phase I and $>4\text{cm}^2$ in Phase II) with a monolithically-integrated readout circuit. SiC photodiodes offer advantages in sensitivity, low dark current, high temperature operation, and higher UV responsivity compared to other commercial UV detector technologies such as GaP. These sensors have applications relevant to Earth and planetary sciences and heliophysics-focused NASA missions. Our technical objectives are the fabrication of very large area SiC photodiodes, in fact larger than what is currently commercially available, and monolithically integrating them with readout circuit components to extend the manufacturability benefits of Si CMOS to the SiC UV sensor arena. As deliverables, we propose to fabricate and deliver large area photodiodes, readout circuit components such as JFETs, and an integrated large area sensor/readout active pixel. We will design the photodiode and other circuit components from the ground-up, with process and electrical performance simulations forming the bases of the structural and fabrication step design, including the development of models for use in circuit simulators. We will optimize and perform the fabrication steps, and electrically and optically characterize the fabricated components using our in-house UV test system.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Organizations Performing Work	Role	Type	Location
CoolCAD Electronics, LLC	Lead Organization	Industry	Takoma Park, Maryland
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations

Maryland

Project Transitions

▶ **June 2015:** Project Start

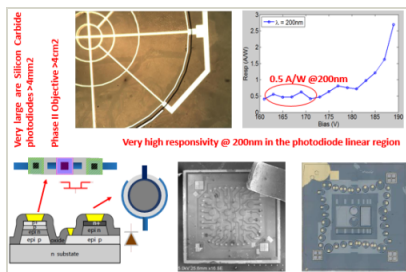
✓ **December 2015:** Closed out

Closeout Summary: Large Area Silicon Carbide Photodiode Active Pixel Sensor, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/139143>)

Images

**Briefing Chart Image**

Large Area Silicon Carbide Photodiode Active Pixel Sensor, Phase I

(<https://techport.nasa.gov/image/135299>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

CoolCAD Electronics, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

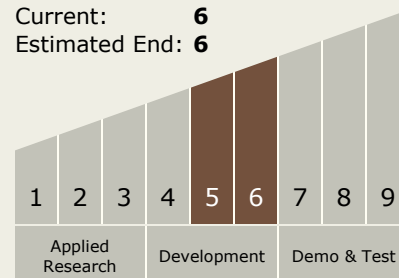
Carlos Torrez

Principal Investigator:

Akin Akturk

Technology Maturity (TRL)

Start: 5
Current: 6
Estimated End: 6



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Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.3 In-Situ Instruments and Sensors
 - └ TX08.3.1 Field and Particle Detectors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System